STARS ACADEMY LAHORE

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1st year MDCAT FORMULA LIST PHYSICS

MEASUREMENTS

IMPORTANT POINTS:

1. 1N $=10^5$ DYNE

2. 1Lb =0.45 Kg

3. Micron$=10^{-6}$m

4. 1 slug =14.5 kg

5. 1 HP =746W

6. 1ev$=1.6 * 10^{-19}$J

7. 1J $= 10^7$ erg

8. 1 Angstrom$=10^{-10}$m

IMPORTANT FORMULAE:

1. $\theta=\frac{S}{r}$

2 steradian.$=A/r^2$

3. Fractional uncertainty$=\frac{\text{Least count}}{\text{measured value}}\times 100$

4. %uncertainty$=\frac{\text{Least count}}{\text{measured value}}\times 100$

5. Average $=\frac{sum\ of\ values}{no.of\ values}$

6. Time period$=\frac{total\ time}{no.of\ vibration}$

NOTE:-

- Absolute uncertainities are added in both addition and subtraction.
- Percentage uncertainities are added in both multiplication and division.
- Multiply the percentage uncertainity by that power.

MOTION AND FORCE

TORQUE:

1. τ=r×F

2. τ =lFsin θ

3. $F_1l_1=F_2l_2$ (at equilibrium)

4. $\tau = I\alpha$

5. $\tau = \frac{\Delta L}{t}$

Distance and displacement:

1. S = v×t

2. Distance in semi circle = π r

3. Distance in circle = $2\pi r$

4. $A \rightarrow B = r_B - r_A$

Speed and velocity:

1. $V_{av}=\frac{2v_1v_2}{v_1+v_2}$ (For same distance)

2. $V_{av}=\frac{v_1+v_2}{2}$

ACCELERATION:

1. $a=\frac{F}{m}$
2. $a=\frac{\Delta v}{\Delta t}$
3. $a_c=\frac{v2}{r}$

EQUATION OF MOTION:

1. $V_f = v_i + at$

2. $S = v_i t + \frac{1}{2} at^2$

3. $2aS = v_f^2 - v_i^2$

MOMENTUM:

1. $P = mv$
2. $\Delta P = F \times \Delta t$
3. $m_1v_1 = m_2v_2$
4. $m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$
5. $P=\sqrt{2mE}$
6. $P = 2E/v$

PROJECTILE MOTION:

1. $V = \sqrt{v_x^2 + v_y^2}$

2. $F = \sqrt{F_x^2 + F_y^2}$

3. $V_h = v_i\cos\theta$

4. $P.E_H = KE_i\sin^2\theta$

5. $R = \frac{v_i^2\sin 2\theta}{g}$

6. $R\tan\theta = \frac{1}{2}gT^2 = 4H$

7. $P = \sqrt{P_x^2 + P_y^2}$

8. $V_{iy} = v_i\sin\theta$

9. $P_h = P_i\cos\theta$

10. $H = \frac{v_i^2\sin^2\theta}{2g}$

11. $H = 1/8\, gT^2$

12. $a = \sqrt{a_x^2 + a_y^2}$

13. $V_{ix} = v_i\cos\theta$

14. $K.E_h = KE_i\cos^2\theta$

OTHER IMPORTANT FORMULAE:

1. $S = \frac{g}{2}t^2$
2. $F = mv/t$
3. $F = p/t$
4. $R=\sqrt{F_1 + F_2 + 2F_1F_2\cos\theta}$
5. $\frac{a_1}{a_2} = \frac{m_2}{m_1}$
6. $S = \frac{g}{2}(2n - 1)$

15. T=$\frac{2v_i \sin\theta}{g}$

WORK AND ENERGY

ALL FORMULAE OF WORK:

1. W = Fd
2. W = = $\frac{1}{2}$ LI^2
3. W = ΔK.E.
4. W = ΔP.E
5. W =PV
6. W =pT
7. W= $\frac{1}{2}$ k x^2
8. W = $\frac{GMm}{r}$
9. W = $\frac{1}{2}$ EAl^2/L
10. W = $\frac{1}{2}$ CV^2
11. W = $\frac{1}{2}$ $I\omega^2$
12. E =mc^2
13. W =Sθ
14. W = Fd cosθ
15. E =θ T^4

POWER:

1. P =$\frac{W}{t}$
2. P =$\frac{mgh}{t}$
3. $\frac{P_1}{P_2}$=$\frac{t_2}{t_1}$

ENERGY(K.E & P.E)

1. K.E =1/2 mv^2
2. ΔK.E=$\frac{1}{2}$m(v_f^2 –v_i^2)
3. ΔP.E=$\frac{1}{2}$mg (h_2- h_1)
4. P.E =mgh

IN COMMON SITUATION

1. P.E=-$\frac{GMm}{r}$
2. K.E =$\frac{GMm}{r}$
3. T.E =$\frac{-GMm}{r}$

ENERGY PRINCIPLE:

1. Loss in P.E= Gain in K.E
2. mg(h_1-h_2) =$\frac{1}{2}$ m(v_2^2– v_1^2)
3. When friction:- mg(h_1-h_2) =$\frac{1}{2}$ m(v_2^2– v_1^2) + fd

CIRCULAR MOTION

RELATION: LINEAR &ANGULAR:

1. S = θ×r
2. I =mr^2
3. V = ω× r
4. a = α× r
5. τ = r × F
6. L = r × P

IMPORTANT FORMULAE CONVERSION

1. P =$\sqrt{2mE}$→L=$\sqrt{2IE_{rot}}$
2. F = ma → t =Iα
3. P = mv →L =Iω
4. V_f= v_i + at →ω_f+ω_i + at
5. 2aS =v_f^2 –v_i^2→2αθ=ω_f^2-ω_i^2
6. v_o=$\sqrt{a_o x_o}$
7. P= 2E/v →L= $2E_{rot}$ /ω
8. F = ΔP /t →τ = ΔL /t

9. $K.E_{rot}=1/2\ mv^2 \rightarrow K.E_{rot}=1/2I\omega^2$

10. $S = v_i t + 1/2\ at^2 \rightarrow \theta = \omega_i t + ½\ \alpha t^2$

VERTICAL MOTION:

1. $T = m(\frac{v^2}{r} + g\cos\theta)$
2. $V = \sqrt{3gr + 2gr\cos\theta}$

ANGULAR DISPLACEMENT:

1. 2πrad= 360° =1 rev
2. 1 rev>1π>1°

GEOSTATIONARY ORBIT:

1. $v = \sqrt{\frac{GM}{r}}$

2. $R^3 \infty T^2$

3. $r^3 = \frac{GMT^2}{4\pi^2}$

4. $R^{\frac{3}{2}} \infty T$

CENTRIPETAL FORCE:

1. $F_c = \frac{mv^2}{r}$
2. $F_c = \frac{mr\omega^2}{r}$
3. $F_c = \frac{I\omega^2}{r}$
4. $F_c = \frac{2K.E_{rot}}{r}$
5. $L\omega/r$

OTHER POINTS:

1. Velocity of low flying satellite=v=$\sqrt{gr}$

2. In $S = r\theta \rightarrow S \perp r \perp \theta$

3. $V = r\omega \rightarrow v \perp r \perp \omega$

4. $a_T = r\alpha \rightarrow a_T \perp r \perp \alpha$

5. $a_{net} = \sqrt{{a_c}^2 + {a_T}^2}$

6. $a = \frac{v^2}{r} = \omega^2 r$

Direction of θ, α, ω, I ,L is along axis of rotation.

OSCILLATION

SIMPLE HARMONIC MOTION:

1. $F = -kx$

2. $a = -\omega^2 x$

3. $K_p = nK$ (parallel)

4. $K_s = k / n$ (series)

5. $K_p/k_s = n^2$

SHM AND UNIFORM CIRCULAR :

1. $X = x_o \sin \omega t$ (mean)

2. $X = X_o \cos \omega t$(extreme)

3.. $V = x_o\omega$

4. $a = v_o\omega$

5. $\frac{V_{max}}{a_{max}} = \frac{1}{\omega^2}$

6. $T_s = nT_p$

6. $V = \frac{1}{2}\frac{k}{m}(x_o^2 - x^2)$

7. $V = x_o \frac{1}{2}\frac{k}{m}(1 - \frac{x2}{xo})$

8. $V = v_o \frac{1}{2}(1 - \frac{x2}{xo})$

9. $V_o = x_o \frac{1}{2}\frac{g}{l}$

SIMPLE PENDULUM:

1. $\omega = \frac{1}{2}\frac{g}{l}$

2. $T = 2\pi\sqrt{\frac{l}{g}}$

3. $f = \frac{1}{2\pi}\sqrt{\frac{l}{g}}$

4. $T = 2\pi\sqrt{\frac{m}{k}}$

5. $g = 4\pi^2\frac{l}{t^2}$

6. T =infinite (whenelevator is free fall)

7. T +a (acceleration upwards)

8. T – a (acceleration downward)

ENERGY CONSERVATION IN SHM:

1. $W = \frac{1}{2}kx^2{}_o$

2. $P.E_{max} = \frac{1}{2}kx^2{}_o$

3. $E = \frac{1}{2}kx_o{}^2(1 - \frac{x^2}{x_o{}^2})$

4. $K.E_{max} = \frac{1}{2}kx^2{}_o$

5. total energy $= \frac{1}{2}kx^2{}_o$

6. $T.E = \frac{1}{2}m\omega^2 x$

K.E	**P.E**	**POSITION X**
0%	100%	$X = x_o$
¼=25%	¾ =75%	$X = \frac{1}{2}\frac{3}{2}x_o$
½ = 50%	½ = 50%	$X = x_o\frac{1}{2}(2)$
½ = 75%	¼ = 25%	$X = x_o/2$

WAVES

WAVE RELATION:

1. $V = f\lambda$
2. $V = \lambda/T$

B/W PHASE AND PATH DIFF.

1. Phase diff. $= \frac{2\pi}{\lambda}$ path diff

2. $\phi = \frac{2\pi}{\lambda}x$

STATIONARY WAVE IN STRETCHED STRING:

1. $V = \frac{1}{2}\sqrt{\frac{F}{m}}$
2. $F = \frac{1}{2l}\sqrt{\frac{T}{\frac{m}{l}}}$
3. $F_n = nf_1$

4. λ_n=2l/n

STATIONARY WAVES IN AIR COLUMN (OPEN):

1. λ_n=2l/n
2. F_n=v/λ_n
3. F_n=nv /2l
4. F_n=nf_1

STATIONARY WAVES IN AIR COLUMN :

1. F_n= nv/ 4l
2. $f_o=2f_o$

DOPPLERS EFFECT:

1. $F' = \frac{v+uo}{v-uo}$ where v = v_m
2. $F' = f\frac{v+uo}{v}$ when observer moves towards stat. source.
3. $F' = f\frac{v-uo}{v}$ when observer moves away from stat. source
4. $F' = f\frac{v}{v-us}$ when source moves towards stat. observer.
5. $F' = f\frac{v}{v+vs}$ when source moves away from stat. observer.
6. $F' = f\frac{v+uo}{v-us}$ if both are moving toward each other.
7. $F' = \frac{v-uo}{v-us}f$ source moving toward and observer away from source
8. $f' = f\frac{v-uo}{v+us}$ if both are moving away from eachother.
9. $F' = f\frac{v+uo}{v+us}$ source away and observer moving toward source.

PHYSICAL OPTICS

YOUNG's DOUBLE SLIT EXPERIMENT :

1. dsinθ=mλ for bright fringe
2. dsinθ= (m+1/2)λ for dark
3. Y=mλ/d for bright
4. Y = (m+1/2)λl/d for dark
5. ΔY= λl/d
6. $\Delta Y_{med}=Y_{air}/n$
7. $\Delta y = \frac{Lc}{fd}$

DIFFRACTION DUE TO NARROW SLIT:

4. λ_n=2l/n

STATIONARY WAVES IN AIR COLUMN (OPEN):

1. λ_n=2l/n
2. F_n=v/λ_n
3. F_n=nv /2l
4. F_n=nf_1

STATIONARY WAVES IN AIR COLUMN :

1. F_n= nv/ 4l
2. f_o=2f_o

DOPPLERS EFFECT:

1.F' =$\frac{v+uo}{v-uo}$ where v = v_m

2.F' =f $\frac{v+uo}{v}$ when observer moves towards stat. source.

3.F'= f$\frac{v-uo}{v}$ when observer moves away from stat. source

4.F'= f$\frac{v}{v-us}$ when source moves towards stat. observer.

5.F' = f$\frac{v}{v+vs}$ when source moves away from stat. observer.

6.F' =f$\frac{v+uo}{v-us}$ if both are moving toward each other.

7. F' =$\frac{v-uo}{v-us}$ f source moving toward and observer away from source

8.f'= f $\frac{v-uo}{v+us}$ if both are moving away from eachother.

9.F' = f$\frac{v+uo}{v+us}$ source away and observer moving toward source.

PHYSICAL OPTICS

YOUNG's DOUBLE SLIT EXPERIMENT :

1.dsinθ=mλ for bright fringe

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4.Y = (m+1/2)λl/d for dark

5.ΔY= λl/d

6.ΔY_{med}=Y_{air}/n

7. Δy =$\frac{Lc}{fd}$

DIFFRACTION DUE TO NARROW SLIT:

MOLAR SPECIFIC HEAT OF GASES:;

1. $\Delta U = C_v \Delta T$

2. $C_p - C_v = R$

3. $C_v = R/\gamma - 1$

4. $C_p = \gamma R/\gamma - 1$

5. $C_v = 1/2\ f\ R$ where f = degree of freedom

6. $C_p = (f + 2/2)R$

7. $\gamma = C_p/C_v$

THERMODYNAMIC SCALE;

1. $T = 273.16 Q_1/Q_3$

2. $Q_1/Q_2 = T_1/273.1616$

3. $\frac{c-0}{100} = \frac{F-32}{180} = \frac{K-273}{100}$

4. $\frac{\Delta c}{100} = \frac{\Delta f}{180} = \frac{\Delta k}{100}$

2nd year MDCAT FORMULA LIST PHYSICS

ELECTROSTATICS

COLOUMB'S LAW:

1. $F = k\frac{q_1 q_2}{r^2}$

2. $K = \frac{1}{4\pi\varepsilon_o}$

3. $F = \frac{1}{4\pi\varepsilon_o}\frac{q_1 q_2}{r^2}$

4. $\varepsilon_r = \frac{\varepsilon_m}{\varepsilon_o}$

5. $\varepsilon_m = \varepsilon_r \varepsilon_o$

6. $F_{med} = \frac{1}{4\pi\varepsilon_o\varepsilon_r}\frac{q_1 q_2}{r^2}$

7. $\varepsilon_r = \frac{Fvac}{Fmed}$

ELECTRIC FIELD INTENSITY:

1. $E = \frac{F}{q}$

2. $E = \frac{1}{4\pi\varepsilon_o}\frac{q}{r^2}$

3. $E_{vac} = \frac{1}{4\pi\varepsilon_o}\frac{q}{r2}$

4. $E_{med} = \frac{1}{4\pi\varepsilon_o\varepsilon_r}\frac{q}{r^2}$

5. $\varepsilon_r = \frac{E_{vac}}{E_{med}}$

6. $E = \frac{\Delta v}{\Delta r}$

7. $E = \frac{\sigma}{\varepsilon_o} = E = \frac{\sigma}{\varepsilon_o\varepsilon_r}$

8. $\frac{F}{F'}=\frac{q_1q_2}{q_1'q'_2}$

9. $F_{med}=\frac{F_{vac}}{\varepsilon_r}$

10. $\frac{F_1}{F_2}=\frac{r^2{}_2}{r^2{}_1}$

11. $F=\frac{q^2}{A\varepsilon_o}$ **12.** $F=\frac{\sigma q}{\varepsilon_o}$

8. $E=\frac{q}{A\varepsilon_o}$

9. $a=\frac{qE}{m}=\frac{a_1}{a_2}=\frac{m_2}{m_1}$

CAPACITANCE OF PARALLEL PLATE CAPACITOR:

1. $Q=CV$
2. $C=Q/V$
3. $C_{vac}=\frac{A\varepsilon_o}{d}$
4. $C_{med}=\frac{A\varepsilon_o\varepsilon_r}{d}$
5. $\varepsilon_r=\frac{C_{med}}{C_{vac}}$

ENERGY STORED IN A CAPACITOR :

1. $E=\frac{1}{2}qV$

2. $E=\frac{1}{2}CV^2 \rightarrow w=Fd=\frac{1}{2}CV^2 \rightarrow F=\frac{CV^2}{2d}$

3. $F=\frac{Q^2}{2d}$

4. $F=\frac{Q^2}{2d}$

5. $E=\frac{1}{2}\frac{\varepsilon_o\varepsilon_r}{d}(Ed^2) \rightarrow E=\frac{1}{2}\varepsilon_o\varepsilon_r E^2(Ad) \rightarrow \frac{1}{2}\varepsilon_o\varepsilon_r E^2$

ELECTRIC POTENTIAL /DIFFERENCE :

1. $V=\frac{W}{q_o}$

2. $V=Ed$

3. $V=k\frac{q}{r}$

4. $V=\frac{qd}{A\varepsilon_o}$

5. $V=\frac{\sigma d}{\varepsilon_o}$

ELECTRON VOLT:

1. $ev=\frac{1}{2}mv^2$

2. $v=\sqrt{\frac{2eV}{m}}$

3. $\Delta K.E = q\Delta V$

CURRENT ELECTRICITY

ELECTRIC CURRENT:

1. $I=\frac{\Delta Q}{\Delta t}$

2. $Q = ne$

3. $I=\frac{ne}{t} \rightarrow I=\frac{(1)e}{T}=I=fe$

4. $I=\frac{\omega}{2\pi}e=I=\frac{v}{2\pi r}$

5. $I=nAeV_d$

DRIFT VELOCITY :

1. $V_d=\frac{I}{neA}$

2. $V_d=\frac{V}{RneA}$

HEATING EFFECT:

1. $H=I^2RT$

2. $H=Pt$

Series Combination

Parallel Combination

OHM's LAW

1. $R_{eq} = R_1 + R_2 + \ldots\ldots\ldots + R_n$

2. $R_{eq} = n\,R$

3. $Vx = \frac{Rx * Vt}{Req}$

4. $\frac{1}{Ps} = \frac{1}{P1} + \frac{1}{P2} + \cdots + \frac{1}{Pn}$

5 . $H_s = \frac{H}{n}$

1. $\frac{1}{Req} = \frac{1}{R1} + \frac{1}{R2} + \cdots + \frac{1}{Rn}$

2. $R_{eq} = \frac{R}{n}$

3. $R_{eq} = n^2 R_{eq}$

4. $P_n = n\,P$

5. $H_p = n\,H$

1. $I = GV$

2. $G = \frac{1}{R}$

3. $I = V/R$

4. $V = IR$

5. $R = V/I$

FOR PARALLEL Comb. Of TWO RESISTORS :

1. $R_{eq} = \frac{R1\,R2}{R1+R2}$
2. $I_1 = \frac{R2}{R1+R2}$
3. $I_2 = \frac{R1}{R1+R2}$

When resistor is cut into 'n' equal parts and bundled together then.

$\rightarrow R' = \frac{R}{n^2}$

RESISTIVITY AND DEPENDENCE UPON TEMP:

1. $R = \rho\, L/A$

2. $R = L / \pi r^2$

3. $R = \frac{4\rho L}{\pi d^2}$

4. $R' = \frac{R}{n} \rightarrow R'$ (new resistance)

5. $R = \rho \frac{L^2}{V}$

6. $R = = \rho \frac{V}{A^2}$

7. $\rho = RA / L$

8. $\sigma = 1 / \rho$

9. $\alpha = \frac{R_t - R_o}{R_o t}$

10. $\alpha = \frac{\Delta R}{R_o\, t}$

11. $\rho = \frac{\pi r^2 V^2}{PL}$

12. $\alpha = \frac{\rho_t - \rho_o}{\rho_o t}$

13. $R_t = R_o(1 + \alpha t)$

ELECTRICPOWER POWER &POWER DISSIPATION :

1. $P = V\frac{\Delta Q}{\Delta t}$

2. $P = VI$

3. $P = I^2 R$

4. $P = V^2 / R$

MAX. POWER OUTPUT:

1. $P_{out} = E^2R/(R+r)^2$

2. $P_{out} = E^2/4R$

EMF & POTENTIAL DIFFERENCE:

1. $E = \frac{\Delta W}{\Delta Q}$

2. $I = \frac{E}{R+r}$

3. E = IR +

4. $V = E - IR$

KIRCHOFF'S FIRST RULE:

$I_1 + I_2 = I_3 + I_4$

KIRCHOFF'S SECOND RULE:

$E_1 - V_1 - E_2 - V_2 = 0$

$E_1 - IR_1 - E_2 - IR_2 = 0$

ELECTROMAGNETISM

FORCE ON A CURRENT CARRYING CONDUCTOR:

1. $F = ILB\sin\theta$

2. $B = \frac{Fm}{IL}$

MAGNETIC FLUX AND FLUX DENSITY :

1. $\phi_B = B.A$

2. $\phi_B = BA\cos\theta$

3. $B = \frac{\phi}{A}$

4. $B = \frac{F_m}{qv}$

AMPERES LAW:

1. $B = \frac{\mu_o I}{2\pi r}$

2. $B = \frac{\mu_o nI}{2\pi R}$ For n loops

3. $B.\Delta L = B\Delta L\cos\theta$

FIELD DUE TO A CURRENT CARRYING SOLENOID :

1. $B = \mu_o nI$

2. $B = \mu_o I \frac{N}{L}$

3. $B = \mu_o \mu_r nI$

4. $\mu_m = \mu_o \mu_r$

5. $\mu_o = \frac{B}{B_o}$

FORCE ON MOVING CHARGE IN MAGNETIC FIELD:

1. $\Delta Q = nALq$
2. $I = nAqv$
3. $F_L = I(L\times B)$
4. $F_L = nAqv(L\times B)$
5. $F = qvB\sin\theta$

DETERMINATION OF $\frac{e}{m}$ OF AN ELECTRON :

1. $\frac{e}{m} = \frac{V}{Br}$
2. $P = mv = qBr$
3. $r = \frac{mv}{eB}$
4. $T = \frac{2\pi m}{eB}$
5. $f = \frac{eB}{2\pi m}$
6. $\omega = \frac{qB}{m}$
7. $ev = \frac{1}{2}mv^2$
8. $v = \sqrt{\frac{2eV}{m}}$
9. $V = \frac{E}{B}$
10. $E = \frac{1}{2m}(qBr)^2$
11. $P = \sqrt{2mE}$
12. $r = \frac{\sqrt{2mE}}{Be}$
13. $P = \frac{2E}{V}$
14. $r = \frac{2E}{eVB}$
15. $\frac{r}{v} = \frac{m}{qB}$
16. $a_c = \frac{qvB}{m}$

ELECTROMAGNETIC INDUCTION

INDUCED EMF & INDUCED CURRENT:

1. $I = \frac{\varepsilon}{R}$
2. $I = V - \frac{\varepsilon}{R}$
3. $V = \varepsilon + IR$

Peak to Peak value

$V_{pp} = 2V_p$

MOTIONAL EMF:

1. $F = qVB\sin\theta$
2. $E_o = VB$
3. $E_o = -\frac{\Delta V}{L}$
4. $\varepsilon = -vBL\sin\theta$

FARADAYS LAW & INDUCED EMF:

1. $\varepsilon = -N\frac{\Delta\Phi}{\Delta t}$
2. $\varepsilon = -N\frac{\Delta B.A}{\Delta t}$
3. $\varepsilon = -N\frac{\Delta BA\cos\theta}{\Delta t}$

SELF INDUCTION:

1. $N\Phi = LI$
2. $\Phi = \frac{LI}{N}$
3. $\varepsilon_L = -L\frac{\Delta I}{\Delta t}$

ENERGY STORED IN AN INDUCTOR:

1. $W = \Delta q\varepsilon_L$
2. $W = \frac{\Delta q}{\Delta t}L\Delta I$
3. $W = \frac{1}{2}LI^2$

ALTERNATING CURRENT & VOLTAGE

1. $V = V_o\sin\omega t$
2. $V = V_o\sin\omega t$
3. $V = V_o\sin 2\pi ft$

4. $\phi = \mu_o nIA$
5. $L = N\mu_o nA$
6. $L = \mu_o n^2 Al$
7. $U_m = \frac{1}{2}(\mu n^2 Al)$
8. $I = \frac{B}{\mu_o n}$
9. $U_m = \frac{1}{2}\frac{Al}{\mu^\circ} B^2$
10. $U_m = \frac{1}{2}\frac{B^2}{\mu^\circ}$

4. $V = V_o \sin\frac{2\pi}{T} \times t$
5. $I = I_o \sin\theta$
6. $I = I_o \sin\omega t$
7. $I = I_o \sin\frac{2\pi}{T} t$
8. $I = I_o \sin 2\pi ft$
9. $V_{rms} = \frac{V_o}{\sqrt{2}} = 0.7V_o$
10. $I_{rms} = \frac{Io}{\sqrt{2}} = 0.7I_o$

TRANSFORMER:

1. $\frac{Vs}{Vp} = \frac{Ns}{Np}$
2. $\frac{Ns}{Np} = \frac{Ip}{Is}$
3. $V_p I_p = V_s I_s$
4. $\frac{Vs}{Vp} = \frac{Ip}{Is}$
5. $\eta = \frac{Power\ output}{power\ input}$
6. $\eta = \frac{V_s V_p}{I_s I_p}$
7. $\frac{\varepsilon_s}{\varepsilon_p} = \frac{N_s}{N_p}$
8. $P_{out} = P_{in} - P_{loss}$

DEFORMATION OF SOLIDS

STRESS:

1. $\sigma = F/A$
2. $\sigma = \frac{mg}{\pi r^2}$
3. $\sigma = \frac{4mg}{\pi d^2}$
4. $\sigma = \rho gl$
5. $\sigma = \frac{mg}{A}$

Strain:

1. $\varepsilon = \frac{\Delta l}{l}$
2. $\varepsilon = \frac{\Delta V}{V}$
3. $\varepsilon = \frac{\Delta a}{a}$

Elastic modulus

1. $E = \frac{\sigma}{\varepsilon}$
2. E for isotherm $= P$
3. E for adiabatic $= \gamma P$
4. $\frac{E_{adiabatic}}{E_{isothermal}} = \gamma$

Young's Modulus:

1. $Y = \frac{Fl}{A\Delta l}$
2. $Y = \frac{mgl}{\pi r^2\,\Delta l}$
3. $Y = \frac{4mgl}{\pi d^2\,\Delta l}$
4. $Y = \frac{Kl}{\pi r^2}$ 6. $\Delta l = \frac{mgl}{Y\pi r^2}$

Shears Modulus

1. $G = \frac{F}{A\tan\theta}$
2. $G = \frac{F}{A\,\theta}$
3. $G = \frac{Fa}{A\Delta a}$
4. $G = \frac{F}{A\gamma}$

Bulk modulus

1. $K = \frac{FV}{A\Delta V}$
2. $K = \frac{mgV}{\pi r^2 \Delta V}$
3. $K = \frac{mgV}{\pi d^2 \Delta V}$
4. $K = \rho gl\frac{V}{\Delta V}$

STRAIN ENERGY :

1. $U = \frac{1}{2} Fl$
2. $U = \frac{1}{2} mgl$

Strain energy density

1. $U_o = \frac{1}{2}\sigma \times \varepsilon$
2. $U_o = \frac{1}{2} Y\varepsilon^2$

3. $U=\frac{1}{2}Fx$
4. $U=\frac{1}{2}kx^2$
5. $U=\frac{1}{2}\left(\frac{EAL_1^2}{L}\right)$
6. $U=\frac{1}{2}\left(\frac{YAL_1^2}{L}\right)$
7. $U=\frac{1}{2}\left(\frac{Fl}{AL}\right)AL$
8. $U=\frac{1}{2}(\sigma\varepsilon AL)$
9. $U=\frac{1}{2}\left(\frac{F^2 l}{AY}\right)$

3. $U_o=\frac{1}{2}\frac{\sigma^2}{Y}$
4. $U_o=\frac{Y}{2}$

ELECTRONICS

OP –AMP:

1. $A_{OL}=\frac{Vo}{V_+ - V_-}$
2. Inverting amplifier=(G)= $-\frac{R2}{R1}$
3. Non inverting amplifier=(Go)=$1+\frac{R2}{R1}$

Transistor as an amplifier:

1. Current gain(β)=$\frac{I_C}{I_\beta}$
2. Amplification factor(A_2)=$-\beta\frac{R_C}{R_{ie}}$
3. $I_E = I_C + I_B$

Rectification:

1. $f_{out}=2f_{in}$
2. $T_{out}=\frac{T_{in}}{2}$

MODERN PHYSICS

Mass- Energy relationship:

1. $E= mc^2$
2. $E_o = m_oc^2$
3. $K.E =(m - m_o)c^2$
4. $\Delta E =\Delta m_oc^2$
5. $\Delta m=\frac{\Delta E}{c^2}$

Energy of photon:

1. E=hf

Weins constant(k):

1. $\lambda_{max} \times T=const$ $K =2.9 * 10^{-3}mk$

Stefens constant(σ)

$E =\sigma T^4 \rightarrow E/T^4$ $=5.67 * 10^{-8}Wm^{-2}K^{-4}$

Planks constant:

$E=hf\rightarrow h=E/f$ $h=6.63*10^{-34}Js$

Photoelectric effect

1. $\frac{1}{2}mv_{max}^2 =eV_o$

2. $E = \frac{hc}{\lambda}$
3. E=pc
4. $P = \frac{pc}{\lambda}$
5. $P = h/\lambda$
6. E=nhf
7. $E = \frac{p^2}{2m}$

2. $hf = hf_o + \frac{1}{2}mv^2_{max}$
3. $hf - \phi = \frac{1}{2}mv_{max}^2$
4. $h(f-f_o) = \frac{1}{2}mv^2_{max}$
5. $\phi = hf_o$
6. $E = \phi + K.E$
7. $hf = \phi + eV_o$

Compton effect:

1. $\lambda = \frac{h}{m_oC}(1 - \cos\theta)$
1. $\frac{h}{m_o c} = 2.43 * 10^{-12}m$
2. $\lambda = \lambda + \frac{h}{m_oC}(1 - \cos\theta)$

Pair production

1. $hf = 2m_oc^2 + K.E(e^-) + K.E(e^+)$

Rydberg constant

1. $\frac{1}{\lambda} = R_h\left(\frac{1}{p^2} - \frac{1}{n^2}\right)$
2. $\lambda = \frac{n^2p^2}{n^2-p^2}\left(\frac{1}{R_n}\right)$
3. $\frac{\lambda_{max}}{\lambda_{min}} = \frac{n^2}{n^2-p^2}$
3. $\frac{1}{\lambda} = R_H.Z^2\left(\frac{1}{n^1{}_2} - \frac{1}{n^2{}_2}\right)$
4. $f = R_Hc.Z^2\left(\frac{1}{n^1{}_2} - \frac{1}{n^2{}_2}\right)$
5. $E = R_Hhc.Z^2\left(\frac{1}{n^1{}_2} - \frac{1}{n^2{}_2}\right)$

De Broglie Equation:

1. $\lambda = \frac{h}{mv} = \frac{h}{p}$
2. $mv = \frac{1}{\lambda}$
3. $\lambda = \frac{h}{\sqrt{meV}}$
4. $\lambda = \frac{h}{\sqrt{mK.E}}$
5. $\lambda = \frac{hc}{E}$
6. λ for $e^- = \frac{12.27}{\sqrt{V}}A^o$
7. λ for $p^+ = \frac{0.286}{\sqrt{V}}A^o$
8. λ for deutron $= \frac{0.202}{\sqrt{V}}A^o$
9. λ for α particle $= \frac{0.101}{\sqrt{V}}A^o$

Bohrs model:

1. $mvr = \frac{nh}{2\pi}$
2. $hf = E_n - E_p = \frac{hc}{\lambda}$
3.

Quantized model:

1. $R_n = \frac{n^2h^2}{4\pi^2kme^2}$
2. $R_n = n^2r_1$ $r_1 = 0.053nm$

Quantized speed:

$V_n = \frac{2\pi ke^2}{nh}$

$V_n = \frac{V_1}{n} = V_1 = 2.18X10^6ms^{-1}$

Quantized energy:

1. $E_n = -\frac{2\pi^2k^2me^4}{n^2h^2}$
2. $E_n = -\frac{E_o}{n^2}$
3. $E_n = -\frac{E_o}{n^2Z^2}$

Production of x-ray:

1. $hf_{k\alpha} = E_L - E_k$
2. $hf_{k\beta} = E_M - E_K$
3. $hf_{k\gamma} = E_N - E_K$

Length contraction:

1. $L = \frac{l_o}{\sqrt{1-\frac{v^2}{c^2}}}$

Mass variation

1. $M = \frac{m_o}{\sqrt{1-\frac{v^2}{c^2}}}$

Time dilation

1. $T = \frac{to}{\sqrt{1-\frac{v^2}{c^2}}}$

Spectral lines emitted : $N_E = \left(\frac{n_2 - n_1 + 1(n_2 - n_1)}{2}\right)$

From n^{th} orbit to ground state $\rightarrow \frac{n(n-1)}{2}$

ATOMIC SPECTRA

CONTINUOUS X-RAYS:

1. $E=hf_{max}$
2. $E=\frac{hc}{\lambda}$
3. $f_{max}=\frac{c}{\lambda_{min}}$
4. $\lambda_{min}=\frac{hC}{ev}$
5. $\lambda_{min}=\frac{1.24\times10^{-6}}{v}$

POWER:

$P=\frac{nhf}{t}$

NUCLEAR PHYSICS

Neutron number:

$N=(A-Z)$

Mass defect:

$\Delta m=Zm_p+(A-Z)m_n-m_{nucleus}$

Binding energy

1. $B.E=\Delta mc^2$
2. $B.E=\frac{\Delta mc2}{1.6*10^\wedge-19}$
3. $B.E =(Zm_p+(A-Z)m_n - m_{nucleus)c}{}^2$

α decay:

$X_z^A \rightarrow Y^{A-4}_{z-2} + He^4_2$

β decay:

$X_z^A \rightarrow Y^a_{z+1} + e^0_{-1}$

Half life :

1. $\Delta N=-\lambda N\Delta t$
2. $\lambda=-\frac{-\Delta N/N}{\Delta t}$
3. $\lambda T_{1/2}=0.693$
4. $\lambda t=1$
5. $N=N_oe^{-\lambda t}$
6. Undecayed=$(\frac{1}{2^n})N_O$
7. Decayed=$(1-\frac{1}{2^n})N_o$
8. $T_{\frac{1}{2}}=0.693T_{mean}$
9. $T_{mean}=\frac{1}{\lambda}$